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Poison in Pink

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POISON IN PINK

By

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Thesis

presented in partial fulfillment of the requirements
for the degree of

Master of Science
in Environmental Studies, Environmental Writing

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Poison in Pink

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Humans slather, spray, mist, and cleanse their bodies with personal care products like lotion, hairspray, cologne, and shampoo every day. Our cupboards are stocked full of them, but few of us understand what is in those jars and bottles. We trust that if it's on the shelf at the store, it's safe. However, this is not always the case, and many personal care products contain chemicals that are harmful to human and environmental health.

My multi-disciplinary Environmental Studies thesis project combines evidenced-based research, interviews, nonfiction narrative, and science communication to create part of a book manuscript intended to educate general consumers about the harmful ingredients found in everyday products in their homes. The book aims to motivate readers to make changes in their own homes and on store shelves.

My thesis begins with an overview to orient the reader to the problem that consumers face. The next chapter, "A Few Drops of No. 5," unpacks the term "fragrance," a catchall term that can be more than one hundred chemical ingredients. In this chapter, I discuss the historical, political, and regulatory context that has given rise to term "fragrance," as well as the chemical ingredients found in fragrance formulations. The third chapter, "Polished," explores the health effects that nail salon workers experience as a result of failed state and federal policies that allow for exposure to harmful chemicals in salons. The three chapters are preceded by a preface to the thesis project and followed by a conclusion, which overviews future plans for the book manuscript.

Preface to *Poison in Pink*

Humans slather, spray, mist, and cleanse their bodies with personal care products like lotion, hairspray, cologne, and shampoo every day. Our cupboards are stocked full of them, but few of us understand what is in those jars and bottles. We trust that if it's on the shelf at the store, it's safe. However, this is not always the case, and personal care products are known to contain carcinogens, endocrine disruptors, neurotoxins, reproductive toxins, and other harmful chemicals. The industry's history of seeing cosmetics as art and innovation have led to a contemporary culture of closely guarded secrets, a culture reinforced by the actions of legislators, industry, and lax regulatory agencies.

The purpose of my thesis project is to lay the groundwork for a book that will educate general consumers about the harmful ingredients found in the everyday products in their homes by presenting scientific evidence of their harmful effects and personal stories of those affected by personal care products. My thesis also tells the story of how this situation came to be through history and policy, and will provide readers information about what they can do to change what's found in their own home and on store shelves.

The final work that will follow this thesis will combine evidenced-based research, interviews, nonfiction narrative, and science communication to create a book manuscript intended to educate general consumers about the harmful ingredients found in everyday products in their homes. I will tell stories gathered from those advocating for change, people impacted by personal care products in some way, and industry players. This will include stories gathered via interview from advocates, corporate lobbyists, scientists, industry stakeholders, and real consumers.

My thesis project contains an introduction and two chapters of the planned final product. These chapters serve as a foundation for more research, investigation, and storytelling. First, my thesis begins with an introduction to the problem that we, as consumers, face.

The first chapter, “A Few Drops of No. 5,” centers around the question: what is “fragrance?” Although the term “fragrance” is found on the labels of virtually every personal care product, this term can be a catchall for more than one hundred different chemical ingredients. This is because of a federal loophole that exempts trade secret ingredients from listing. However, toxic ingredients often hide behind the guise of “fragrance.” In this chapter, I unpack “fragrance” by describing the historical, political and regulatory context that has given rise to the trade secret term, as well as the key chemical ingredients found in fragrance formulations.

The second chapter, “Polished,” explores the negative health effects that nail salon workers experience. I discuss the chemical ingredients that nail salon workers are exposed to and some of the connections that have been made between health and nail salon work. This chapter also covers the forces that have given rise to nail salon workers’ chemical exposure: regulatory failings on the state and federal level, industry influences, and basic human injustices.

Finally, my thesis concludes with an overview of my future plans for the book manuscript. This section contains information for future topics of research and an approach for the project’s completion.

Introduction

*Live your eyeliner, breathe your lipstick
and kill for each other – Lady Gaga*

My mom used to sell Mary Kay. She'd hold parties in our house: finger sandwiches, jugs of cheap wine, and women painting their faces in the season's newest colors of eyeshadow and lipstick. Banished to the babysitter, I'd wander around her living room, imagining what the women at the party were doing, wishing that I were old enough to swirl a wine glass and rosy my cheeks with blush. My strut would change, and my six or seven or eight-year-old body would transform as I imitated the women in old movies. I'd walk on the balls of my feet, floating through space, chest forward and shoulders back. That was how beautiful women moved.

For my eighth birthday, my silent wishes were fulfilled. My mom and some of her friends agreed to do makeup for me and a handful of friends of my own. I knew better than to wiggle or complain when the makeover got uncomfortable, as putting on makeup inevitably is. I diligently blinked my eyes open and closed on the mascara brush, sucked my mouth in like a fish to apply blush, and blotted my lips onto a folded Kleenex.

I stood from my seat at the kitchen table, transformed. Putting on the act only went so far. Now, I had the cheeks and lips and eyes to match.

Mary Kay's signature pink eyeshadow palettes were a constant in the most significant moments of my adolescence. I'd sit on the closed toilet seat, eyes shut, chin tilted up while my mom swashed my eyelids in purples, pinks, and browns. Then I'd run off to a school dance, a birthday party, or a choir concert. Those palettes, pink and black mascara wands, and eyeliner crayons constructed an early understanding of beauty to a girl growing up in the 90s. Sitting on that toilet lid, I formed expectations that would nestle deep in my subconscious.

It never occurred to me to wonder what any of those pink products contained. When I did start to wonder, I was nineteen. Mary Kay had been replaced by M.A.C., Estée Lauder, and Bobby Brown. As a college freshman, I was finally outgrowing teenage awkwardness. I gained command of my body—a six-foot frame prompted countless wishes to be shorter. I grew into my nose a bit. I learned how to use a curling iron.

One night, visiting my parents on a break from college, I walked into the bathroom of my parents' Midwest, small-town home, and closed the door behind me. Something, some catalyst that I don't remember, prompted me to flip over every box, bottle, and container. I skimmed them all: butylated hydroxytoluene, sodium laureth sulfate, ethylparaben, parfum, oxybenzone, dibutyl phthalate. A hard rock of intuition settled in my gut.

I sat on the closed toilet seat, the contents of the vanity strewn about, ashamed and betrayed. Ashamed for never thinking to wonder. Betrayed by a company that was an inextricable part of my childhood, that claimed to empower women, including my mother, through beauty.

I wrote down a list of what seemed like particularly suspect ingredients, words that sounded to be from another language, and began a research process that has since never ended. I started reading labels. I started asking questions.

Almost a decade later, I'm still learning. What I know now is that personal care products like body wash, shampoo, lotion, and makeup contain thousands of chemicals. Many have little to no toxicological data. Many are unregulated.

The personal care products industry is worth \$71 billion; from money comes power. Self-advancing and self-regulating industry bodies, laissez-faire Food and Drug Administration

regulations, and shocking research revealing the human and environmental health effects of harsh ingredients raise huge questions about the products we use every day on our own bodies, the bodies of our children, and that eventually get washed down the drain or dumped in landfills. As consumers, we have no idea what is truly in our makeup bags and vanities. Nor, in many cases, do researchers or industry.

What we do know about personal care products is cause for concern. Chemical ingredients have been linked to cancer, endocrine disruption, neurological damage, developmental disabilities, reproductive problems, heavy metal poisoning, and so much more.

Phthalates, a group of nearly unavoidable chemicals used widely in personal care products, have been linked to endocrine disruption, particularly in boys. As endocrine disruptors, phthalates can masquerade as hormones. They enter our bodies in infinitesimally small amounts, sometimes in parts per billion, and can impact numerous bodily functions regulated by hormones. We know that more boys than ever are born with altered sexual development that impacts fertility and masculinization.

In girls, exposure to endocrine disruptors is associated with early onset puberty, the timing of which is associated with breast cancer later in life. The age of puberty in our little girls is getting younger and younger, especially in black girls. Concurrently, the number of adult black women who die from breast cancer is the highest of any group.

The women who earn their livelihoods making us beautiful are particularly impacted by chemicals in personal care products. Cosmetologists, hairdressers, and nail salon workers are exposed to elevated levels of harmful chemicals like toluene. Toluene is a well-established occupational hazard associated with neurotoxicity. Our beauty workers suffer from chronic

headaches, fertility problems, respiratory issues, and more, some of which have been connected to work in the salon.

The research connecting health effects to exposure to chemical ingredients, either in the home or at work, is growing. Some of the connections are still tenuous, but some researchers assert that the use of personal care products is a significant route of exposure to some chemicals.

Some chemical ingredients accumulate in our fat, breast milk, and blood plasma. Some can also accumulate in our environment. Chemical ingredients are found in our food sources—dairy, meat, fish—and in our municipal drinking water. Our aquatic environments, a precious resource for us and our planet's wildlife, contain significant levels of chemical ingredients in certain parts of the United States and beyond.

What we don't know about chemical ingredients might be even scarier. The FDA has assessed only a small fraction of personal care product ingredients for their safety, and has banned just eleven. This eleven stands in stark contrast to the more than 1,100 chemical ingredients banned in the European Union. The Cosmetic Ingredient Review, an industry safety board, has only evaluated eleven percent of 10,000 chemical ingredients used in cosmetics. Each day, we are exposed to up to thousands of poorly understood chemicals.

Women disproportionately suffer from the chemicals in personal care products. We use on average twelve products a day on our own bodies and are more likely to handle products used on our children. We, women, are hairdressers, nail salon workers, cosmetologists, and massage therapists. We are also our children's first exposure to personal care products—in the womb and through our breast milk. And while women take on this extreme chemical burden, this isn't just our issue; men, too, use products every day. This is a story we all share.

And so is the story of beauty. Our inclination to clean, beautify, and perfume ourselves is imprinted in the cultural DNA of humans. Men wore makeup into the 18th Century. Now, for better or worse, wearing makeup is often a cultural expectation of women around the world. Fragrance has long been an integral part of history around the globe, and today is a \$38.8 billion industry. To varying degrees, we are all expected to maintain a certain level of cleanliness. Every single one of us uses cosmetics or personal care products.

It's hard to know who to trust. Regulatory loopholes have created a culture of secrecy that permeates much of the personal care product industry. The FDA isn't doing its job to protect consumers. Self-regulating industry bodies publish self-serving research. Makeup and care product companies continue to sell products containing toxic ingredients. Big time cancer charities endorse products containing established carcinogens, profiting from the suffering of our mothers, sisters, friends and children. Mary Kay, and the rest of the industry, is getting away with murder.

Until the industry and government step up, being an educated consumer about personal care product ingredients will be a constant challenge. A single personal care product can have more than a hundred ingredients. How can a consumer be expected to learn safety testing protocols and results, intermediary chemicals used in production, and manufacturing processes used with all of these ingredients? Multiple that number (100+ chemicals per product) by the number of personal care products we use daily (twelve for women, six for men), and it becomes clear how unmanageable this is.

So where do we start? A conversation. Having conversations about toxic chemicals is scary and confusing and overwhelming. But in this book, you'll find chapters on chemical

ingredients found in our homes, our communities, and our environments. The last section contains information about what you, as a consumer, can do to affect change, both on the small scale within your own vanity, and on a larger systemic scale, changing what's found on store shelves. The issue is complicated, and my research is an attempt to make sense of it for myself. I hope that it will help you make sense of it too.

Chapter One

A Few Drops of N°5

“Give a woman the best product you can, market it in the perfect bottle, beautiful in its simplicity yet impeccable in taste, ask a reasonable price for it, and you will witness the birth of a business the size of which the world has never seen.”

– François Coty:

*Genius “nose,” industry game-changer, founder of legendary perfumery—
Coty*

My first oh-so-serious crush wore BOD body spray. I thought the company must have died in the mid-2000s, but the scent endures, although much less enthusiastically. I can count on less than one hand the occasions I’ve smelled BOD Really Ripped Abs since my early 2000s crush, but those times stick with me: at a frat party in Iowa, at a college basketball game in Wisconsin, and on a mall escalator at a forgotten location. All of these settings feel fitting. These three moments pulled me back through time to a cul-de-sac in small town, Wisconsin, lying on the pavement in thick Midwestern humidity and watching my crush shoot hoops. Or to a skate park, one of many tween girls perched on top of the half pipe, breathing in cheap cologne as boys whirred past.

I’m not alone in this. For me, Really Ripped Abs conjures up forgotten moments. For others, it’s warming spices, lemon-scented cleaners, tobacco pipes, laundry soaps. Smell is the sense most strongly tied to memory. The direct connection between the human nose and the brain can elicit immediate strong emotional responses, and bring up (sometimes unwanted) memories.

Scents embed themselves into our individual histories, but also play a part in the history of humanity. Two Neolithic perfume containers discovered in Syria date back to 7,000 BC, some

of the most ancient ever found. Gilgamesh burned cedar and myrtle to call forth the gods. The Egyptians obsessed over perfume and fragrance, dousing themselves and their dead in scents like cedar, believing it brought them not only physical perfection, but spiritual perfection. The three wise men brought baby Jesus gold, myrrh, and frankincense—two fragrant oils then worth more than gold. For much of history, fragrance played a crucial role in medicine.

Despite this global history, it makes sense why, when I think of perfume, I think of France: creative perfumers or “noses,” colonialism, and an unmatched history of producing luxury items. Think: champagne. Think: Cartier diamonds. Think: haute couture.

Louis XIV, King of France late in the 17th Century and into early the 18th Century, helped France establish its reputation of luxury. He and his court wore a different scent every day of the week supplied by master perfumers, one of which was Houbigant, the enduring perfume giant.

Houbigant was also the perfumer for Marie Antoinette, who—legend has it—was recognized by her perfume when she attempted to flee persecution; only the rich and the royal could afford the fragrance. Another unverifiable legend declares that Marie Antoinette brought a few vials of the maker’s scents to give her strength when she faced the guillotine.

Perfume production in France doubled in the last half of the 19th Century. This growth occurred despite limited availability of raw and intermediate materials used by perfume makers. Most fragrances used the same perfume base, and so smelled alike. The similarity of perfumes then stands in contrast to the variety of scents found at an average department store counter today.

Colonialism meant new land and climates, bringing opportunities to grow new raw fragrance materials. Plants that couldn’t grow well in France, like orange trees, geraniums, and eucalyptus, flourished in colonial territories. This, in combination with new methods of

extracting plant essences, the creation of synthetic fragrances, a surge in railroad construction, and innovations in glassmaking and printmaking shot the fragrance industry upward. It would never fall again.

It was in the 1800s that perfumes started to change, and a perfume industry that resembles our modern industry was born. Fragrances were no longer only intended to directly mimic nature. Perfume makers created more complex and abstract scents that combined novel scents with scents found in nature—or perfumes that stood in abstraction alone.

Houbigant's Fougère Royale, created by Paul Parquet, marks the end of single note perfumes and the beginning of a new approach to perfume. Created in 1882, Fougère Royale was perhaps the first perfume with three notes. Prior, most perfumes had only two, or even one note. Now, most perfumes contain at least three.

Fougère Royale was also the first perfume to contain a synthetic component, which mimicked the scent of ferns. The fragrance was intended for women, but accidentally adopted by men. That ubiquitous earthy, green, musky scent we smell in men's cologne today—its origin story is Fougère Royale.

While most perfumers of France (and Britain) focused on creating high-end items that most of us couldn't have afforded, a new perfumer rolled in, an untrained outsider with a nose for luxury, but an aptitude for mass production. François Coty created two new categories of scents—soft sweet floral and chypre—embracing synthetic ingredients despite industry's established avoidance of them, and created the first four-note perfume.

But at first, no one wanted perfume from the new kid. Coty dramatically resorted to intentionally smashing a perfume bottle on a department store counter during an attempt to get the store to carry it. Clearly, he was desperate. But the lovely scent inundated the store, and

patrons flocked to the counter in droves. They demanded to buy his perfume. He sold out in minutes, and the store offered him retail space.

His first scent, La Rose Jacqueminot made him a millionaire. His next scents, for which he collaborated with famous glassmaker René Lalique, made him France's first billionaire. Coty irritated the old boys' club of established perfumers like Houbigant and Guerlain with his tactics to remove perfume from its bourgeois status. Coty took luxury, re-packaged and re-branded it, and sold it to the masses.

In 1921, Gabrielle "Coco" Chanel came onto the scene. One of her lovers introduced her to Ernest Beaux, a perfumer to Russian royalty, who Chanel commissioned to create a scent for her thriving fashion house. He created an abstract scent that ditched the simplicity of single note floral scents typical of the time and used a bouquet of over 80 different scents. The result is mysterious. When presented with samples numbered 1-5 and 20-24 to choose from, Coco chose number 5—Chanel No. 5.

Still, Chanel No. 5 is one of the most successful perfumes of all time. In its 100+ years, the scent's advertising has donned the faces of some of the most beautiful women, and even "Sexiest Man Alive," Brad Pitt. The scent became a household name, and secured a place in history in 1952 when Marilyn Monroe answered, "What do you wear to bed?" with "A few drops of No. 5." Andy Warhol even paid homage to the scent in his signature colors in 1985.

Chanel No. 5 was one of the first perfumes to use aldehydes, a group of synthetic chemicals. Aldehydes are a diverse group, capable of invoking many different smells, but they usually fall underneath the umbrella of soapy-waxy-lemony-floral. Some aldehydes also give fragrances a little fizzy pop—like the first sip of champagne. Coco intended for her perfume to

be synthetic. She said, “I wanted an artificial perfume. That’s right, artificial, like a dress—meaning manufactured. I am a designer of couture. I want a perfume that is a composition.” Chanel No. 5’s dizzying success encouraged other perfumers to explore embracing synthetic components in their own perfume formulations.

The creation of Chanel No. 5 was a turning point for the perfume industry. No. 5 set transformation in motion; perfume started to change gradually. The shift was set in stone in the 1970s, a business era that emphasized making lots of perfume—quickly and cheaply. This, in combination with an industry more willing to use synthetic components, has resulted in modern production methods that are drastically different from those of Houbigant and Coty. Now, perfumes are mass-produced and synthetic ingredients are the norm. One thing hasn’t changed since Houbigant: perfumers still closely guard their fragrance formulations.

Despite the significant departure from the practices of early perfume makers, modern perfumeries clutch their legacies with white knuckles. For so long, perfume making was an expression of art; perfume makers were called artisans—bringing together skilled handy work and the art and science of chemistry. Perfumers dedicated their lives to creating beautiful scents. The creative process was often a family affair, passed down through generations.

These works of art embedded themselves in our social fabric. The human love affair with fragrance is a manifestation of our strong connection to smell—we experience the world through our senses, and we tinker with presenting our most beautiful selves to the world.

Now, despite such drastic changes in perfume making, this heritage serves as justification for trade secret laws. Because fragrance formulations are often a combination of many different chemical ingredients, a legislative loophole allows cosmetic makers to call these formulations simply “fragrance,” “parfum,” or “eau de toilette” on labels.

The loophole is in the Federal Packaging and Labeling Act, or FLPA for short, which requires cosmetic companies to list every ingredient on product packaging. There are a lot of nit-picky rules, like listing the ingredients in descending order of predominance, but regardless of the obsession over detail, trade secrets are exempt from listing. And there's no way for us to find out this information.

The 1974 Freedom of Information Act, which usually grants the public the right to get information from the Feds and its agencies, like the FDA, is totally useless for trade secrets. Since FLPA says, "nothing... shall be deemed to require that any trade secret be divulged," we're totally out of luck. Call up a perfume company and ask for their formulation—expect a click on the other end.

Perfume makers do not want their signature scents stolen, their secret ingredient discovered, or their lives' work scooped. It's understandable, but with the exception of some small fragrance houses, perfume making is no longer an art. It has become an industry, through and through.

Today's massive fragrance industry, worth \$38.8 billion, makes 20th Century Coty look like a small-fry. While perfumes are no longer marketed under the brand Coty, the company now has a portfolio of 77 big name brands. Now, in the 21st Century, Coty is: Clairol, COVERGIRL, Marc Jacobs, Calvin Klein, Chloé. For so long, Coty hid behind a bigger name. In 1963, François's wife sold Coty to Pfizer, one of the largest pharmaceutical companies in the world. In 1992, Pfizer sold Coty to German company JAB Holding Company.

In the 1980s, mergers were a routine practice in the perfume industry. Larger companies sucked up smaller companies, resulting in new corporate mammoths: L'Oréal, Estée Lauder, Unilever, Procter & Gamble, Sanofi, and Shiseido.

As a result, enormous portfolios are commonplace in the fragrance industry. L'Oréal owns Ralph Lauren, Yves Saint Laurent's beauty division, Lancôme, Giorgio Armani, and Diesel. But, L'Oréal is owned partially by Nestlé. In a 2016 merger of Procter & Gamble and Coty, Coty acquired P&G brands Stella McCartney, Gucci, COVERGIRL, Lacoste Fragrances, and HUGO BOSS. JAB Holding Company remains the largest individual stakeholder of Coty. Kering, a holding group own by pharmaceutical megalith Sanofi, claims ownership of Stella McCartney and Gucci, but a 25-year long licensing feud allowed P&G to sell fragrances under the brands' names. Keeping track of who owns who is a nearly impossible puzzle, and these brands are only a small part of it; this doesn't even take into consideration fragranced personal care products like shampoo and lotion.

The number of celebrity perfumes is as dizzying as the perfume counter itself. It seems every celebrity has a perfume: JWoww, Christina Aguilera, Celine Dion, Kim Kardashian, Justin Bieber, Taylor Swift, JLO, Britney Spears (of her 16 fragrances, Private Show takes the win for best name), Jennifer Anniston, Ariana Grande, Sarah Jessica Parker, Katy Perry, Nicki Minaj, Usher, Mariah Carey, Elizabeth Taylor, One Direction, Paris Hilton (8 fragrances!), Rhianna, Beyoncé, Jessica Simpson, David Beckham, P. Diddy, Michael Jackson, Lady Gaga, Shakira, Avril Lavigne, Khloe and Lamar (their fragrance is called unbreakable bond... but apparently it was breakable, evidenced by their breakup in 2012), Madonna, Prince, Queen Latifah, Gwen Stefani, Halle Berry, and Danielle Steel (indeed, the romance novelist), and of course, Mr. Bruce Willis. Most of these can be found at Kohl's, apparently a hot spot for reasonably priced

celebrity fragrances. Celebrity brands are in high demand, though most of these celebrities don't own their own fragrances. Track these fragrances back to their rightful owners, and you'll arrive at the same companies: P&G, L'Oréal, and Unilever.

The fragrance industry's business practices—gobbling up small companies and hiding corporate trade secrets—are similar to those of the commercial chemical industry. Perhaps because that is what the fragrance industry has become. But what's so different about the fragrance industry is that we put these scented products directly on our bodies.

The industry's huge corporate giants have the strength to protect their secrets. Because of the trade secret loophole, many fragrance chemicals we don't know much about—including some of their identities. Of the ingredients we do know to be hiding behind “fragrance,” many are chemicals harmful to humans and the environment.

...

When I bought my first bottle of perfume (Ralph by Ralph Lauren, the one with the blue label), my mom had to okay it first. After bringing it home, I spritzed it on, smelling fruity, fresh and slightly floral. Upon first sniff, she told me the scent wasn't “offensive,” but told me not to go overboard. She had always been an advocate for temperance in the perfume department—you shouldn't be able to smell someone's perfume just by walking by them, she'd say. You should have to get within their bubble. Otherwise, you're wearing too much.

As a fourteen-year-old, I was irritated by the need for my mother's stamp of approval on my fragrance choices. At the time, I perceived it as her being slightly overbearing, and that I, as such the adult I thought I was at fourteen, could make my own decisions. I found her powerful nose somewhat annoying. She was constantly smelling things invisible to the rest of the family. “Do you smell that?” she'd ask. The answer was almost always in unison: “no.”

When we read pasta sauce labels at the grocery store, and a woman doused in perfume pulled up her cart to select a sauce of her own, we left the aisle. We'd go back later when the fragrance trail dissipated. Sometimes it wasn't perfume; my mom also picked up on shampoos, lotions, and hairspray.

I felt annoyed by her loathing of perfume and fragrance. *It's just perfume*, I'd think. *Let people wear what they want*. I didn't understand then that what I perceived as an idiosyncrasy was actually a physiological reaction to perfume. I finally came to understand that, for my mother, exposure to these fragrances could mean respiratory irritation or tightness in her chest. With some scents, she described feeling like she was being asphyxiated. Sometimes after encountering the wrong scent in the pasta aisle, she'd wake up with a migraine that left her in bed all day.

My mother is not an anomaly. Somewhere between two to eleven percent of the population is sensitized to fragrance ingredients. Around five percent of children who are dermatology patients are sensitized too.

Sensitization requires exposure to an allergen. This could be either repeated exposure, say from the using the same product every day for many years, or from being exposed to a large amount of an allergen acutely, like in an occupational setting. As a result of this exposure, the body's immune system creates immune cells that "remember" the allergen. Then, when a sensitized person is exposed to the same allergen again, those memory immune cells can deploy (along with other non-memory immune cells), and migrate to the site of the exposure, initiating a full-frontal attack—an allergic immune response.

In this kind of reaction, only a small amount of an allergen is needed to provoke an attack. The reaction can take hours or days to manifest after contact with the allergen. Once someone is sensitized to an allergen, he or she is sensitized for the rest of their lives.

One important distinction between sensitization and allergy is that being sensitized to an allergen does not necessarily mean that one would experience a clinical response when exposed to the allergen again. A sensitized individual simply just has the memory immune cells in his or her system. However, sensitization is necessary for certain clinical allergic responses, which would involve showing symptoms of an allergic reaction.

Allergic immune responses to fragrance ingredients can manifest in several ways including skin itchiness, blisters, and red bumps, as well as coughing and wheezing. Most commonly, allergic reactions occur on the hands, face, legs, feet, and armpits. Fragrance allergies may also exacerbate asthmatic symptoms and can trigger asthmatic episodes. People with asthma are more likely to be irritated by products containing fragrance ingredients than people without asthma.

Eczema on the hands is often associated with fragrance allergy. According to Women's Voices for the Earth, an advocacy group focusing on the impacts of personal care products on women and the environment, to many of us without hand eczema, the condition is often only viewed as bothersome, but it can impact quality of life by causing people with the condition to have to take sick leave or change professions.

“Fragrance” is the most common allergen in personal care products. However, because fragrance formulations can contain more than a hundred ingredients and trade secret laws protect the make-up of these formulations, it is impossible to learn which of those hundred ingredients is the true culprit. Physicians can request fragrance formulation information from fragrance

manufacturers, but the process is expensive and time-intensive. While this process may result in learning what the true cause of the allergy, it doesn't matter much when these ingredients are not required to be listed on labels. Consumers with allergies cannot avoid the offending chemical anyway.

Fragrance allergy impacts such a large part of the population that the European Union has established twenty-six common chemical allergens that are required to be listed on product labels.¹ Because of the fragrance industry's long-standing tradition of protecting fragrance formulations, and US federal legislation that allows for this secrecy, none of these twenty-six chemicals are required for listing in the United States.

In a study published in *British Journal of Dermatology* determining the frequency at which these 26 were listed on product labels in the U.K., almost 90 percent of the 300 products studied contained one or more of the fragrance allergens. Linalool was the most common allergen overall, occurring in 66 percent of personal care products. Linalool and limonene were the most frequently listed fragrance allergens in both men's products and women's perfumes.

Linalool, often considered in the floral fresh family, is a common top note, and has been used as such in perfume icons like Chanel No. 5, Opium, and Diorella. The component, which can be synthesized, but is also a component of essential oils, was detected in 95 percent of perfumes.

Women's perfumes also contained the highest average number of fragrance allergens, with an average of twelve of the twenty-six allergens listed on a product. This is compared to

¹ These twenty-six chemicals include amyl cinnamal, amyl cinnamyl alcohol, anise alcohol, benzyl alcohol, benzyl benzoate, benzyl cinnamate, benzyl salicylate, butylphenyl methylpropional (trade name Lillal), cinnamal, cinnamyl alcohol, citral, citronellol, coumarin, eugenol, farnesol, geraniol, hexyl cinnamal, hexyl cinnamal, hydroxyisohexyl 3-cyclohexene carboxaldehyde, hydroxycitronellal, isoeugenol, alpha-isomethyl ionone, (DL)-limonene, linalool, methyl 2-octynoate (methyl heptin carbonate), evernia furfuracea (trea moss), evernia prunastric (oak moss).

other personal care products more generally, which contained an average of four of the twenty-six fragrance allergens.

Linalool is listed as an allergen of special concern by the European Union, along with eleven other allergens: cinnamal, cinnamyl alcohol, citral, coumarin, eugenol, farnesol, geraniol, hydroxyisohexyl carboxaldehyde, hydroxycitronellal, isoeugenol, and (DL-)limonene. Because of the high frequency that these allergens occur in products in the U.K., we can assume that they occur at a similar frequency in American products. Yet, these allergens do not need to be labeled here in the U.S.

Women are more likely than men to be allergic to fragrance ingredients. At the University of California, San Francisco School of Medicine, Modjtahedi and his group of fellow researchers determined that being a woman could be a factor in allergic contact dermatitis because women are more frequently exposed to allergens. Elberling and researchers at Denmark's National Allergy Research Centre corroborated this, reporting that being a woman was a "strong indicator" of experiencing eye and respiratory irritation from fragrance exposure. Women also become sensitized to fragrances earlier than men do, often between the ages twenty and twenty-nine. Women not only disproportionately experience fragrance allergies, but also report that they are more significantly affected by their fragrance allergy in their everyday lives.

Higher rates of fragrance allergy in women could be because women are exposed to more personal care products (and cleaning products) than men. Female-dominated occupations are also more likely to be associated with a fragrance allergy. Researchers found that two female-dominated jobs—masseuse and cosmetologist—were at an increased risk of fragrance-related allergies. Women also often work in jobs associated with "wet work," in which their hands are frequently wet or damp. When the hands are wet, the skin barrier is more permeable to the

absorption of chemical ingredients, making women doing wet work potentially more susceptible to the absorption of fragrance allergens.

Because it is unfeasible to determine which fragrance ingredients cause allergies in the United States, dermatologists and doctors often recommend that patients simply avoid fragranced products. However, this is a nearly impossible feat. “Unscented” products are not required to be free of fragrance ingredients, rather just free of scents. In unscented product formulations, manufacturers often use masking ingredients, which are fragrance ingredients designed to cover up the smell of odorous ingredients. Ironically, some fragrance allergens are used as masking ingredients, like geraniol, eugenol, hydroxycitronellal, and isoeugenol. All four of these are listed as allergens of special concern by the EU.

“Fragrance-free” products are free of fragrance ingredients. However, like unscented products, some fragrance-free products contain fragrance allergens. This could be because true fragrance ingredients are defined as chemicals with the sole purpose of fragrancing a product. So if a fragrance chemical also serves another purpose in a product, for example serving as an emulsifier, surfactant, UV filter, or emollient, the ingredient could be used in a fragrance-free product.

BOD Really Ripped Abs was likely my first conscious exposure to synthetic musks. The cologne was a mix of sharp freshness and an animalistic sexiness new to me the time. At least that’s how I remember it. Now, it likely smells more like a dirty teenager covering up days without a shower with an unsophisticated scent—like the experiences conjured by BOD’s contemporary counterpart, Axe Body Spray.

As the name signifies, musks smell musky—animalistic, earthy, dank, and like your lover’s dirty, but sweet-smelling armpit. Musks can also smell sweetly fresh, depending on how they are used in combination with other ingredients. Musks have an interesting history, originating from the apocrine gland of the musk deer, which is primarily found in Asia and Russia. The musk deer, a quirky little fanged creature, was hunted nearly to extinction, partially due to the high demand for musks, until the establishment of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, or CITES, in 1975. Although the first synthetic musks were created in the late 19th Century, and used in perfume legends like Chanel No. 5, it wasn’t until CITES was established that industry shifted to synthetics for good.

Musks are used in virtually every perfume, as they can produce a “sense of pleasure... without the perceiver being aware of the true nature of the stimulus.” Because of their ability to invoke this feeling, musks have been called the most important fragrance ingredient.

Musks, which fall into three main categories, nitromusks, polycyclic musks, and macrocyclic musks, are often used in combination, rather than independently, in fragrances. A perfect example of this is Calvin Klein’s Obsession, which uses Galaxolide, Tonalide, ethylene brassylate, musk ketone, and Cashmeran—all musks—in one formulation. The product is an intoxicatingly sexy musk, balanced with intense sweetness.

When we think of the smell of freshly washed linens, we are often truly thinking of the smell of Galaxolide, a polycyclic musk. The musk is frequently used in laundry detergent and fabric softeners—and is one of the reasons for that freshly-washed smell so many of us love.

Musks are everywhere. In a study by the Campaign for Safe Cosmetics, Environmental Working Group, Breast Cancer Fund and Commonweal testing for the occurrence of different musks, all the products tested contained at least one of the three polycyclic musks they tested for:

Galaxolide, Tonalide, and Cashmeran. The most commonly detected musk was Galaxolide. The next most commonly detected was ethylene brassylate, a macrocyclic musk.

Due to their pervasive use in fine fragrance, personal care products, and consumer products, it is not surprising that they have been detected in the aquatic environment, industrial wastewater, and municipal sewage systems. Nitromusks and polycyclic musks are often environmentally persistent, but researchers don't understand the full effect these pollutants may have on wildlife.

Dermally applied products, like personal care products containing fragrance, can be a significant route of exposure, especially when products are applied in certain combinations. Once absorbed, because musk fragrances are lipophilic, meaning they love and gravitate towards fat, musks can concentrate in fat tissue and breast milk.

Galaxolide, a polycyclic musk, has gained the attention of activists in recent years because of its environmental persistence and potentially adverse effects. Galaxolide is a proprietary blend of the polycyclic musk HHCB and plasticizers like the phthalate DEHP. In Greenscreen for Safer Chemicals testing, a tool used to assess the potential hazards of chemicals, Galaxolide received a score of *Benchmark 1*, a designation assigned to “chemicals of highest concern whose use should be avoided.” Galaxolide has been detected in high concentrations in the Great Lakes, to which Nic Clark, the State Director of Michigan Clean Water Action, responded, “We cannot ignore the risk the pollutant, Galaxolide, is having on this invaluable resource.”

Galaxolide is also found in high concentrations in the human body. It was the principal musks found in adipose tissue of Korean Females, the breast milk of Swedish mothers, and in the blood plasma of women over the age of 50. One study published in *International Journal of*

Hygiene and Environmental Health found an association between the use of perfume, deodorant and shampoo with concentrations of Galaxolide in blood plasma.

Tonalide, another polycyclic musk has some of the same concerns as Galaxolide. Researchers at the Netherlands Institute for Developmental Biology and Utrecht University found that Tonalide exhibits weak estrogenic activity, acting like natural estrogen would in the body. However, another group of researchers at Utrecht University, in conjunction with a private lab, found that the chemical is one of four polycyclic musks (along with Galaxolide) that are estrogen, androgen, and progesterone antagonists, meaning they compete with native chemicals for spots to hook into receptors, often occupying those spots, preventing the right chemicals from hooking on. The results of these two studies show that we don't really understand how Tonalide behaves in the human body quite yet. Despite our lack of understanding, Tonalide, like Galaxolide, was found in high concentrations in the water of the Great Lakes and wastewater sludge.

Musk ketone, a nitromusk, was detected in 85 percent of the blood of women tested in one study. Musk ketone can increase the proliferation of breast cancer cells, and act as a substance toxic to cells. It can also act as a weak phototoxin, a chemical that can cause an allergic reaction or become toxic when it is exposed to sunlight.

Musk ketone may also be an endocrine disruptor. Endocrine disruptors can mimic our hormones, which are chemicals that control numerous functions in our bodies, especially during development and puberty. Our bodies only require miniscule amounts of certain hormones to initiate an action in the body or to initiate communication between different parts of the body. Because we respond to tiny amounts, sometimes in the magnitude of parts per billion (or even less), some endocrine disruptors can impact our system by being hormone imposters in

unfathomably small amounts. Certain cancers, like breast cancer, are greatly impacted and controlled by hormones.

Musk xylene, another synthetic musk, is a nitromusk still actively in use. The chemical was one of the first synthetic musks ever produced. Like musk ketone, the chemical has demonstrated the ability to increase proliferation of breast cancer cells. Like Galaxolide, it has been detected in breast milk and in blood plasma in women over 50. It was also detected in 95 percent of the blood of women tested of varying ages.

Musk xylene may be an endocrine disruptor. The chemical's endocrine disruption capabilities may be worsened by musk xylene's transformation process; the chemical is reduced to its amine form, which increases its estrogenic abilities. This is unusual; in musk ketone, the chemical's amine form has weaker estrogenic abilities.

Despite these potentially adverse effects, the Scientific Committee on Cosmetic Products and Non-food Products Intended for Consumers, the advisory board to the EU, has determined musk xylene to be safe up to one percent in fine fragrances and .03 percent in other products.

We seem to know some about the risks associated with musks, but we don't know enough. Some older synthetic nitromusks are being phased out because of their potentially adverse effects on human health. Their production can also be hazardous. Albert Baur accidentally discovered nitromusks at the end of the 19th Century while studying TNT; the byproduct of creating TNT has a musky odor. He quickly learned synthetic nitromusks could be replacements for natural musks, and he sought out other analogues. Because they are related to TNT, the production of some nitromusks can be dangerous.

Now, these outdated nitromusks are being replaced by new musks with little or no toxicological information available. What we do know about musks trips the alarm that newer

musks (like Galaxolide and Tonalide) could be human and environment health concerns. In spite of this potential, there are no current restrictions on synthetic musks set by either the federal government or self-regulating industry bodies.

Because of musks' presence in virtually every single fragranced product, we'll continue to be exposed to them, regardless of our lack of understanding about their true health concerns—however big or small they might ultimately prove to be.

Musks are used in so many fragranced products because they are commonly used as base notes. Notes are the key to how we experience fragrance over time. Apply fragrance and the first whiff is composed of top notes. They evaporate quickly—around one to twenty minutes, depending on the fragrance—but first impressions are important. Many consumers purchase perfume based on top notes, which are usually fresh like citrus and lavender.

After the top notes disappear, the middle notes emerge. The wearer carries these notes on her skin for up to two hours, giving the base notes time to react with the chemistry of the wearer's skin. The middle notes are often floral. The middle notes in combination with the top notes are also designed to cover up the initially not-so-pleasant smelling base notes; they need time to mellow.

Finally, after thirty minutes to a couple of hours, the base notes materialize. As mentioned previously, musks are common base notes, along with oak moss, patchouli, woody scents and vanillin. The way in which the notes react with the person wearing the perfume or cologne affects how the fragrance smells—and why perfumes smell somewhat differently on different people. The woman behind the perfume counter wasn't lying when she said to wear the perfume around the store for a couple hours before making a purchase.

Constructing fragrance notes is based on perfume constituents' volatility, or their tendency to evaporate. Base notes, which last the longest, are the least volatile. Because they are the least volatile, they last the longest on the wearer's skin. Musks, a group of chemicals that we don't understand well enough, are some of the fragrance ingredients we carry on our skin the longest.

The volatility of fragrance ingredients can be manipulated using fixatives. Fixatives can "hold back," another ingredient, meaning they can reduce the volatility of another ingredient, making it last longer. Fixatives can hold back ingredients to varying degrees, meaning that fixatives can have a substantial impact on how the final product will smell.

Phthalates are often used as fixatives in fragrance. Phthalates are also used as moisturizers, anti-foaming agents, anti-cracking agents in nail polish, plasticizers, which make plastics more flexible and stronger, and as solvents, which dissolve another ingredient and hold it suspended in the solution. Phthalates, pronounced with a silent "ph" (THAL-ates), are everywhere: New car smell, pleather, shower curtains, carpet, perfume—all phthalates.

Phthalates are released into the environment throughout their lifespan: upon creation in the factory, spritzing in our homes, disposal in our landfills, and rinsing in the shower. Once in the environment, phthalates are easily taken up the food chain, and are therefore reintroduced to the human body in another way—through the meat, fish, and dairy that we consume.

Phthalates can enter our bodies through multiple pathways. Because some phthalates readily off-gas, they can be inhaled as you soak yourself in BOD before a date (you can always tell a single man by the amount of cologne he wears). These phthalates are very volatile chemicals, tending to become vapor: imagine a small, invisible cloud suspended after spraying cologne. Inhaling that cloud of, say, phthalate-laced BOD, is an important route of exposure.

Other phthalates are absorbed through the skin. Phthalates are lipophilic. Lipo = fat. Philic = love. Phthalates love fat, making them readily absorbed through our skin. Phthalates' lipophilicity makes smearing them on our skin another important route of exposure to the group of chemicals, and because once lipophilic compounds enter our bodies, it's difficult to get them out. Our kidneys, the workhorse of excretion in the human body, excrete mostly water soluble wastes.

Numerous studies document the endocrine disrupting potential of phthalates. In males, researchers have documented altered sexual development. Some of the impacts on developing males include: decreased testis weight, reduced anogenital distance, modifications in developing sex organs, reduced accessory sex organ weights, modifications in sex cells, reduced fertility and more. Phthalates may also impact the quality of semen, potentially contributing to infertility issues.

According to two researchers, Joanna Jurewicz and Wojciech Hanke at the Nofer Institute of Occupational Medicine in Poland, reviewing all the available literature on the endocrine disrupting potential of phthalates, "Animal studies have shown that exposure to phthalates results in profound and irreversible changes in the development of reproductive tract especially in males, raising the possibility that phthalate exposures could be the leading cause of the reproductive disorders in humans." Animal studies have been corroborated by epidemiological studies, suggesting that there is a strong connection between phthalate exposure and endocrine disruption.

In girls, there is a small body of evidence for the ability of phthalates to induce early onset puberty. Because early puberty is associated with an increased risk of breast cancer, early onset puberty in girls is particularly concerning. As a result of exposure to phthalates DEHP,

BBP, DINP, and/or DBP², girls may also experience endocrine disrupting effects like uterine abnormalities, reduced fertility, and problems with thyroid function.

The Endocrine Disruption Exchange, an authoritative body on the endocrine disruption capabilities of several chemicals, lists DBP, DEHP, and DEP all as endocrine disruptors. DEP is commonly used in fragranced products to increase the longevity of a product after it's sprayed. The chemical can irritate the eyes, skin, nose, and throat, and can cause headaches, dizziness, and nausea in occupational settings.

Phthalates are commonly found in house dust. One group of researchers found that allergic responses in children were associated with phthalate exposure at levels normally found indoors. The presence of the phthalate DEHP has been associated with elevated levels of asthma in children. Multiple studies corroborate phthalates' ability to induce allergic symptoms. Finally, there is limited evidence of carcinogenicity.

Because of their documented negative health impacts and widespread use, the U.S. Consumer Product Safety Commission banned some phthalates for use in "childcare articles" in 2009. The Commission banned DEHP, DBP, and BBP in quantities greater than 0.1 percent. Despite recognizing that these chemical ingredients are harmful to children, there is no current ban in cosmetics, and as a result, a new wave of plasticizers has hit the consumer market. These include: di(2-ethylhexyl) adipate (DEHA), di(2-ethylhexyl) terephthalate (DEHT), and diisononyl cyclohexane-1,2-dicarboxylate (DINCH). However, as one paper by Yirui Liang and Ying Xu from the University of Texas at Austin noted, "given that these alternatives have properties similar to those of phthalates, similar... environmental fates may be expected."

² DEHP is short for Bis (2-ethylhexyl) phthalate, BBP for benzyl butyl phthalate, DINP for diisononyl phthalate, and DBP for dibutyl phthalate.

Phthalates are everywhere, so in some ways, it's not surprising to learn they are in personal care products. I was, however, surprised to learn that fragrance formulations contain sunscreen ingredients. But it's not to protect the wearer from the sun. Some ingredients degrade in the sunlight, and so UV filters are added to protect the perfume or cologne as it sits in its pretty crystal bottle. Some commonly added UV filters are the same as those we find in the sunscreens we apply on sunny days: homosalate, octinoxate, avobenzone, and oxybenzone.

When applied as part of a sunscreen, UV filters are rapidly absorbed through the skin. However, we're not sure how much of those sunscreens are absorbed when applied in a fragrance formulation. In data from countries that are not exposed to year-round sunlight, sunscreen chemicals were found all year-round in the bodies of those studied, indicating that other sources of UV filters—like cosmetics—could be significant sources of exposure. In addition to cosmetics, babies who are breastfed are exposed through breast milk.

Homosalate has demonstrated some endocrine disrupting abilities in vitro (in cell cultures), but researchers have not confirmed this in animal models. One preliminary study concluded that significant amounts of homosalate can penetrate through the skin. We don't yet know enough about homosalate to determine the full scale of its adverse health effects.

On the other hand, we know a lot about the adverse health effects of octinoxate, which is also called octyl methoxycinnamate or OMC for short. Octinoxate is an endocrine disruptor and is toxic to the human reproductive system. The UV filter can generate reactive oxygen species within the epidermis, or outmost layer, of the skin. Reactive oxygen species can cause cascades of events that interrupt proper cell functioning.

Oxybenzone has also demonstrated endocrine disruption capabilities in both animals and in vitro. The chemical's endocrine disrupting potential may take place through a number of

avenues: acting as an antagonist (aka a competitor) on progesterone receptors, affecting sperm density, and interfering with the hypothalamus-pituitary-thyroid axis, the hormone superhighway running down from the brain to the genitals, containing on-ramps and off-ramps for hormones. The superhighway is indispensable, as it is necessary for most hormonal actions in the body. Like octinoxate, oxybenzone also has the capability to generate reactive oxygen species within the epidermis. Because of its adverse health effects, Japan has instituted a concentration limit on oxybenzone in some cosmetics. Oxybenzone is unregulated in cosmetics in the United States.

In addition to these four groups of chemicals—allergens, phthalates, musks, and sunscreens—there are number of other problematic chemicals used in fragrances, including parabens, sulfates, preservatives, and more. With all these groups of chemicals, there is so much we don't know. However, with trade secret laws, it's hard to know where to start. Without ingredient disclosure, how can we, as consumers, know where to start looking for answers?

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It's not just about perfume. Yes, perfumes use high concentrations of fragrance ingredients, but flip over virtually any personal care product—shampoo, lotion, conditioner, body wash—and you'll see “fragrance,” “parfum,” “natural fragrance” or other similar terms. Fragrance also hides in unexpected products: lipstick, blush, eyeshadow, and foundation. These products contain identical fragrance ingredients as perfumes and might be a greater source of exposure than perfume or cologne.

How did it get this way? How did these problematic ingredients in fragrance formulations end up in our products? When we pull something off the shelf, we presume that someone must be looking out for us. Someone had to assess the safety of that product before it was sold, right? Unfortunately, this is not the case. Lax federal regulations, alongside the fragrance industry's

culture of secrecy and inadequate safety testing have created products that are unsafe for us and our families.

The FDA is behind the abundance of problematic and mysterious ingredients in personal care products. The agency regulates “cosmetics,” an umbrella term for makeup, perfume, and personal care products, under authority granted by Congress using two laws.

The first law is The Federal Food, Drug and Cosmetic Act, or FD&C. The law defines three kinds of products: cosmetics, drugs, and soaps, all of which are determined by the intended use for a product. Using a product to “beautify” yourself? Cosmetic. To promote “attractiveness?” Cosmetic. To cure an illness? Drug. To treat disease? Drug.

Soaps are a whole different story. Very few true soaps still exist on today’s market. True soaps combine fats or oils with an alkali. This is quite different than the body wash in your shower. Most of the products we describe as “soap” are actually sudsing detergents like body wash, bar soap, and hand soap. The three categories, cosmetics, drugs and soaps, are all regulated very differently under FDA regulations (albeit not very well across the board).

Under FD&C, companies have a legal responsibility to ensure that their products, including cosmetics, are safe for consumers. But the problem is, in formulation, the company or manufacturer can use virtually anything they’d like, as long as the company follows three tenets: 1) individual ingredients and the cosmetic as a whole are safe if used in compliance with the label, 2) the product is labeled in accordance with the Fair Packaging and Labeling Act, and 3) the product isn’t misbranded according to FDA policy.

The same safety standards apply across all cosmetics: face cream, hair spray, shampoo lotion, body wash, lip balm, and bath bombs (which are gaining popularity thanks to Instagram).

These standards also apply to perfumes—that includes our favorites like Chanel No. 5 and BOD Really Ripped Abs.

For both fragrance and other cosmetics, the FDA does not demand companies get FDA approval for any ingredient or product before sending it to market. Although companies don't need approval, they are theoretically held legally responsible for the safety of individual ingredients and formulations. It's just that the definition of safety is fluid. Not a single law or policy on the books requires cosmetic manufacturers to perform specific, regimented safety testing before using an ingredient or sending a product to market.

The FDA *advises* manufacturers to perform safety testing on their own products, but it's just advice. The FDA provides two ways that companies can substantiate their products' safety to consumers. The first is reliance on previous toxicological data. What's problematic about this is twofold. First, upon the enactment of the 1976 Toxic Substances Control, around 60,000 chemicals in commerce at the time were grandfathered in as safe, untested. Since, its installment, very few of those chemicals have been tested for safety, and only five grandfathered chemicals have been restricted.³ Second, researchers have revealed that many of those grandfathered chemicals are potentially harmful to human health. Some grandfathered chemicals are endocrine disruptors, neurotoxins, obesogens (chemicals that disrupt metabolism and make us fat), carcinogens, allergens, and sensitizers—and the FDA considers these as safe.

The second way companies can substantiate a product's safety to consumers is through any other study the company thinks is appropriate. This advice is quite vague, and companies

³ TSCA was updated in 2016. However, these updates will not improve regulation of chemicals in personal care products specifically. They improve regulation of chemicals in commerce in general, prioritizing a handful of chemicals for review each year. It is unlikely that any chemicals of concern in personal care products will be reviewed any time soon, as other chemicals will probably be prioritized.

can take it or leave it. The ones who take it, substantiate their safety claims with industry-funded, incomplete, unpublished, or proprietary research. In some cases, companies just leave it.

If the FDA does miraculously find a product, company or individual is not in compliance with FDA regulations, the agency reserves the right to enforce action against the company or individual that violated the policy. Litigation and seizure of products are regulatory means to enforce compliance, but these practices are very rarely done. For example, a number of advocacy groups, including Women's Voices for the Earth and Environmental Working Group have been urging the FDA to remove Brazilian Blowout, a keratin hair-straightening product with a substantial body of evidence of severe harm to human health, from the shelves, but the FDA has failed to do so. The FDA's inaction has resulted in a freshly filed lawsuit in December 2016.

The FDA doesn't even require companies to register their companies or formulations with the FDA. Rather, the agency has created the Voluntary Cosmetic Registration Program, or VCRP. The FDA uses information gathered from the VCRP to evaluate cosmetic products. But with voluntary registration, the sample size is limited and companies choose when and how much to disclose. The public can access any information divulged to the VCRP—except for trade secrets, of course.

The information that the VCRP does gather, however small, is used to inform the Cosmetic Ingredient Review, a voluntary self-regulating industry body created by the Personal Care Product Council in 1976. The Cosmetic Ingredient Review, or CIR, is composed of voting and non-voting members that evaluate cosmetic ingredients' safety. The voting members are toxicologists, chemists, and dermatologists; non-voting members are reps from the FDA, various consumer groups, and the Personal Care Product Council itself.

The CIR requires certain information about cosmetic ingredients to be submitted to determine if a product is safe, safe under certain conditions, or unsafe. The Review requires: concentration of use, chemistry data, skin irritation and sensitivity information, skin absorption data, and genetic toxicity. The panel can also request whatever additional information they think is necessary. Health endpoints the CIR's list is missing: endocrine disruption, carcinogenicity, neurotoxicity, and developmental toxicity. Looks like they're missing some important ones.

Essentially, the CIR is the science arm of the Personal Care Products Council, a national trade association that lobbies both federal and state legislators for policies that reflect the concerns and needs of the beauty industry. To "protect" industry interests, the PAC focuses on electing officials "with views that are consistent with the industry." Translated to real terms, this means candidates that are anti-proper regulation of cosmetics with potentially toxic substances like carcinogens and endocrine disruptors. Once those candidates are elected, the PAC puts sustained intense pressure on politicians to vote in the best interest of the industry.

The PAC's mission suggests supporting candidates that oppose keeping potentially toxic substances like carcinogens, endocrine disruptors, reproductive toxins out of cosmetics. For example, in California in 2004, the Personal Care Products Council spent \$550,000 lobbying against legislation like AB 908, a bill sponsored by California Democrat Judy Chu. The legislation would have banned phthalates from all cosmetics sold in the state of California.

The Personal Care Products Council is 500 companies strong and includes the world's fragrance giants: Coty, Pfizer, Proctor & Gamble, Unilever, Shiseido, L'Oréal, Avon, and Estée Lauder.⁴

⁴ If you've been buying Aveda to avoid all of these political shenanigans, don't be fooled. Aveda was purchased by Estée Lauder in 1997, and consequently is a member of the PCPC's PAC.

Add another acronym to the list: IFRA. The International Fragrance Association, a self-regulating industry body that sets voluntary standards for fragrance manufacturers and holds members accountable by performing spot checks of personal care products containing fragrance. If a member violates IFRA policy, the Association lists the offender's name on its website. This is how they hold their members accountable—public shaming. I couldn't find any other evidence of harsher punishment. The IFRA has only banned 150 fragrance ingredients so far, most of which are egregiously toxic. The Association lists an additional 2,000 chemicals currently in use in fragrance on its website, though some chemicals known to be used in fragrance formulations are missing.

The science arm of the IFRA is called the Research Institute for Fragrance Materials. The Institute performs safety testing, collections, and analysis of fragrance ingredient data. The organization's research, reviewed by an independent "Expert Panel," supposedly has no connection to the fragrance industry. However, according to WVE, the panel is "handpicked" by industry and the information they analyze is "compiled by," "often generated by" and "curated by" fragrance industry staff. This doesn't sound quite like an independent panel to me.

The Institute, called RIFM for short, also pays considerable attention to acute toxicity and dermatological impacts, as opposed to endocrine disruption, carcinogenicity, neurotoxicity or other chronic issues—sounds just like what's missing from the CIR's list. WVE also asserts that there is a "noticeable omission of expert panel review on any fragrance chemicals which are controversial due to their potential toxicity." This includes musks and phthalates, two groups with either established or potential endocrine disrupting abilities.

RIFM's research is not held to the same standards as science in the public and academic realms. Many of the studies are done by RIFM staff in RIFM labs, and the results are often not

peer-reviewed. Sometimes the results are not published at all. Or, if it's published, it's published in the organization's fragrance database.

The database, which the organization boasts as the largest fragrance database in the world, is only available to access through subscription. To get a subscription, you've got to have been in the fragrance industry for at least a year. The cost of a subscription depends on a company's revenue, leading some companies to drop millions of dollars just for access.

As a member of the general public, it is impossible to access these databases without a subscription. Rumor has it that many of the databases only publish their findings, and not the methods anyway. A company might publish "research" in the database, but really, it's just conclusions, some as short as a few sentences. Other companies can simply accept these safety verdicts as true, without evaluating the methods themselves, methods they couldn't evaluate even if they wanted to.

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It's clear that industry doesn't want consumers to see the results of these studies, but why? Since they continually ensure us that their products are safe, what have they got to hide from us? This lack of safety testing and accountability in the industry, in conjunction with trade secret laws and a culture of secrecy, do not invoke consumer trust. The fragrance industry's creative, artisan past is not enough of a justification for the existence of current trade secret laws. Toxic chemicals should not be allowed to hide under the façade of "fragrance. We, as consumers, deserve to know every ingredient in every product we use every day, and we deserve products that are safe.

It's been fifteen years since I purchased my first perfume, and now, I no longer wear any. Perfume doesn't seem to bother me much. I haven't inherited the allergy symptoms my mother and her mother experience when they're exposed—at least not yet. Both of them became allergic after the birth of their children. Time will tell if this is a fate dictated by motherhood—both through my family's maternal line and through becoming a mother.

Instead, I choose not to wear perfume because I have too many unanswered questions. This is not a long-term solution. We are continually asked to sacrifice so much—for the fate of our health, the fate of our children, and the fate of our planet. I wish that this didn't have to be a call for sacrifice. But until we are given safe options, we might have to set our bottles of Chanel No. 5 and BOD aside, and ask fragrance manufacturers hard questions: What is in this product that I put on my body every day? Why won't you, the company, disclose what's in it? Why is corporate profit and trade secret more important than the health of our bodies, the bodies of our children, and the planet? We must demand answers.

Chapter Two

Polished

“I believe in manicures.”

-THE Audrey Hepburn

I’ve been in the service industry for almost ten years. Whether it’s right or wrong is a different question, but in the service industry, looks matter. Looking good means more money. There’s some research on this: attractive servers make more than their less attractive co-workers—a lot more. At least an additional \$1,000 in tips per year. But it’s also a well-understood fact known by service industry workers across the country. The money is better when you look better—and “better” is synonymous with conventional, mainstream beauty: dark eye makeup, smooth and polished hair, a little gloss on your lips.

Because restaurant managers also know this well, most restaurants have dress codes—even if it’s as simple as looking “decent.” At a restaurant I worked for in Minneapolis, we were required to wear “appropriate undergarments” (meaning: don’t go without a bra) and “appropriate cosmetics” (meaning: please wear makeup). I also remember the words “polished,” “put together,” and “nice” being thrown around in training. The dress code stated that we should look “date-ready.” The staff found this laughable; we had to wear black athletic material polos, matched with black slacks, and non-slip shoes, which were usually grandpa sneakers with Velcro. Not exactly date attire. But what was above the polo collar was important—a done-up face. As a bartender, I was spared the black polo (thank god) and could wear anything of my choice, as long as it was black on black, and that infamous word, “nice.”

The enforcement of the “polished” standard came out in not-so-nice ways. One manager told a server, a good friend of mine, that she looked “haggard” one day when she came to work

without makeup. When that same friend arrived with a botched dye job, a different manager made her drive to the drugstore to buy a headband. (I will admit, it was pretty bad—but still.) All of us were the targets of numerous comments about our slightly disheveled hair, lack of lip gloss, or carelessly tucked shirts. All of this is because managers are in on the secret—good-looking servers make restaurants more money. Attractive servers contribute to an attractive restaurant ambience, generating repeat guests; people want to be part of something they perceive as beautiful.

I figured I might as well play the beauty game. Why not make a little extra money if it was as easy as some lip gloss? So, I curled my hair every day, chose outfits that were flattering, painted on a smoky eye, and splashed pink gloss across my lips. An important part of looking polished meant immaculate nails. Most women know this is traditionally part of the equation. But nail polish is a health risk in the service industry; it chips and peels, and the next thing you know, you've got glitter in your cheese fries. So gel nails—they were a tiny miracle. Gels use a technique in which a gel-like substance is painted on to your nails and then cured with UV light. They don't chip or peel. They're practically made of titanium once they're dry, requiring you to soak your fingers in essentially straight-up acetone for 10 minutes to remove them. Gel manicures became an inextricable part of my “polished” workplace look. For three years, on schedule, I headed to the same salon on Hennepin Avenue in Uptown, Minneapolis. Every two or three weeks I got a fresh gel manicure, and the occasional pedicure.

This three-year cycle of gel manicures may seem like the result of working in an image-centered industry, but the truth is this concept of beauty, in which nails are a crucial part of the formula, was planted in my psyche early. My mom and I shared a large nail polish collection, which we housed in a Rubbermaid container. When my mom became an esthetician, a beauty

professional offering facials, wraps and waxing, when I was in 7th grade, I hit the nail polish motherlode. OPI nail polish became my favorite brand because of their wide assortment colors and their witty nail polish names like *I Eat Mainly Lobster* and *My Dogsled is a Hybrid*. They were \$7 a pop at the drugstore, but at a beauty supply store, my mom could purchase them for half the price. Our collection grew and when that Rubbermaid couldn't house our polishes anymore, my favorites found a home in a floral shoebox.

My increased access to OPI initiated a two-year phase where I re-painted my nails every week. The result was a fuchsia stain on the cream carpet in the center of my bedroom, an iridescent purple stain on my cheetah print throw pillows, and a colorful array of stains on the closet carpet, where I kept the shoebox. I made my way through the rainbow—hitting practically every hue including the neons—until I did eventually land on black (OPI's *Black Onyx*). My mother was less than pleased about this color selection, but I suspect that she was grateful it only lasted a week here and there, until I was on to the next color.

I skipped out on the nail polish in college, mostly out of necessity. I was just too busy. So when bartending brought me the reason (and the cash) to get frequent manicures, I was once again addicted.

I had a sneaking suspicion that my frequent manicures probably weren't great for my health. I had come across a few articles online about it, but mostly ignored them. There was also the wafting, strong chemical stench that rushed out from the salon when I opened the front door. I thought, *nothing good for you could possibly smell like that*. If you've ever been to a salon, you know the smell that I'm talking about. It can be almost paralyzing. But this smell is just part of the nail experience. That, and being greeted with, "pick a color!" and a Vanna White arm gesturing toward the wall of nail polish. What's a little chemical exposure when you look good?

The trade-off seemed fair to me. It didn't hurt that my polished image was making me more money at work.

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Two years after moving from Minneapolis to Missoula, Montana, I arrived at the Women's Voices for the Earth office on a cold day. Pulling open the door, I glanced down at my naked nails. The manicures stopped when I arrived in Montana. In a city where real cowboys mingle with city dwellers, naked nails are acceptable. There is no polished standard.

I headed up the dark stairway, and arrived into a distinctly 70s office with no receptionist and no signage. I tentatively wandered down the hall, checking the door plaques for familiar names. Eventually, I found an open door with Alex Scranton, WVE's Director of Science and Research, typing at her computer, surrounded by stacks of papers, seemingly in disarray. When I gently tapped on the door frame, Alex invited me in.

We had met before. She and I attended the same graduate program, though at different times, and first met when she was a guest speaker in one of my classes, speaking about her experience working at WVE.

I looked for two places to sit—one for me and one for my coffee. Alex removed a heap of papers from a chair, and shuffled the documents and books on her desk, revealing a 2 by 2-inch square for my coffee. Besides the abundance of papers, Alex's office had little other decoration: a small bookshelf, potted plants by the window. Alex herself was undecorated. She appeared to be devoid of makeup, but with her work and her extensive knowledge of product ingredients, this did not surprise me.

I was there to talk with Alex about nail salon workers and products. About fifteen years ago, researchers from the CDC published a study which found that phthalates, that group of

chemicals from Chapter 1 that are most often used to make plastic more flexible, were present at high levels in the human body, especially in women. Human health advocates wanted to know why levels were higher in women and wondered if it might be related to personal care products. So, a group of female advocates—Jane Houlihan of Environmental Working Group, Charlotte Brody of Health Care Without Harm, and Bryony Schwan of Coming Clean and WVE—commissioned product testing, particularly of perfume, but some nail polishes too, to see what kind of phthalates were in the formulations.

The results came back and Alex told me, “And oh, whaddya know? These things have got craaaazy amounts of phthalates in them. And this could be why women have higher levels in their bodies.”

These results were a catalyst for action. Bryony, Charlotte, Jane, and journalist-turned-activist Stacy Malkan formed the Campaign for Safe Cosmetics. The Environmental Working Group created their Skin Deep database, an amazing online resource for information about personal care product ingredients. Some of the women began collecting data on product formulations in an effort to determine which products had the most phthalates. Turns out, it’s nail products.

WVE analyzed the product data, but thought about how often women really get manicures and pedicures. On one end of the spectrum, you’ve got women like me, in my bartending days, who get manicures once every two weeks, and on the other end, you’ve got women who only get them on special occasions. The team wondered if phthalates in nail products could really have that big of an impact on human health when we get manicures infrequently.

But then it came to them— “Oh wait a second. The really seriously impacted population here is going to be the nail salon workers, who are doing manicures every single day. And there was just no research out there.” Alex paused. “We don’t know anything about this population of nail salon workers, but they’re totally under-researched, and they’re probably seriously impacted by these chemicals and nobody is really regulating or paying attention.”

In our conversation, Alex focused on Vietnamese nail salon workers in California. California employs more nail salon workers than any other state in the United States, the overwhelming majority of whom are of Vietnamese descent. In the U.S., 97 percent of nail salon workers are women. This means that the majority of nail salon workers in California, a huge chunk of the general population of salon workers nationwide, are women of Vietnamese descent.

California’s nail salon industry has tripled over the last thirty years, and this immense growth can partially be attributed to the growing number of Vietnamese immigrants who have sought employment as nail salon workers.⁵ In 1987, only 10 percent of all US nail salon workers were of Vietnamese descent. By 2002, the number skyrocketed to 59 percent. The numbers are even greater in California. In 2012, Vietnamese workers were an estimated 80 percent of the state’s salon workforce.⁶

Worried about the health impacts of this industry, WVE wanted to reach out to nail salon workers. However, Alex said, “we soon came to realize that Women’s Voice for the Earth,

⁵ Cosmetologists perform nail and hair services, whereas manicurists perform only nail services. Manicurists are also referred to as pedicurists, nail salon technicians, and nail salon workers. Because the duties of cosmetologists and manicurists overlap, I consider studies concerned with both types of workers who will be referred to as nail salon technicians or nail salon workers.

⁶ These numbers include Vietnamese Americans, which includes naturalized citizens, second generation, and third generation Vietnamese Americans. These numbers also include undocumented nail technicians. It is important to note that these numbers are estimates and are somewhat unreliable. They are based on *NAILS*, a leading industry magazine which does not disclose all their sources, and the Department of Labor Bureau of Statistics, which does not disclose the percentage of workers who are undocumented. Also, an exposé by Sarah Maslin Nir in *The New York Times* in 2015 found that most salon workers in New York City are working and living in the United States without documentation. Although this only reveals information about the immigration status of nail salon workers in New York City specifically, it is not unreasonable to believe that there are a number of undocumented workers in California as well, who may or may not have been included in these statistics. What we do know: women of Vietnamese descent dominate the industry in California and women of Korean descent dominate the industry in the New York City metro. These two geographic areas employ the most nail salon workers in the country.

centered in Montana, we're not the group to be reaching out to Vietnamese nail salon workers in California. We do not have those connections, skills, the language. Okay—that is not our role, but we can find the people who *can* do that.”

Enter Julia Liou and Thu Quach.

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In conversation with Thu Quach, I learned that she and Julia Liou are best friends. This seems like a small metaphor for the larger community that both Thu and Julia are deeply embedded. Thu is the daughter of a nail salon worker and through the women's friendship, Julia became close to Thu's mom. Their work has been about the community since the beginning.

Because so many Vietnamese women are drawn to the profession, nail salons have become part of the social fabric for some communities. Catherine A. Porter, the Policy Director at the California Healthy Nail Salon Collaborative, an organization instrumental in advocating for nail salon workers, says “the nail salon industry represents a significant niche market for Vietnamese immigrants in California and has become an economic cornerstone of the community.” Julia Liou, co-founder of the California Healthy Nail Salon Collaborative, describes the nail salon industry as the “economic lifeblood for immigrant communities.” Nail salons are often owned by family and friends, making it easy for women to tap into the community. These connections provide what Thu, the other co-founder, calls “ethnic business networks.” Working in nail salons is about more than just employment; it's about finding a place within a strong, well-connected community.

This community is at the center of Thu and Julia's advocacy work. In conversation with Thu, she tells me that she didn't become a scientist to do science; she became a scientist because these communities need science on their side: “I became a professional in this area because I saw

a need in it...I have always thought of myself as part of the community. Having family members, including my mom, that had worked in hair and nail, I came upon the issue and decided to apply science.” Motivated by her community, Thu sought a Master’s in Public Health from UCLA. While in school, her mother died of cancer. Almost ten years later, Thu received her PhD in Epidemiology from UC Berkeley. Her dissertation on cancer risk in California’s nail salon workers is dedicated to her mother.

In 2000, Julia graduated from UCLA with a Master’s in Public Health. Her strong friendship with Thu, forged in their Master’s program, led her to the California Healthy Nail Salon Collaborative. When Thu received funding for the organization, she turned to Julia for the organization’s leadership.

Now, these women blur the line that usually stands firmly between science and advocacy. Thu says it’s a necessity. Often in science, Thu says, “the head and the heart seem so disconnected.” What’s the point of science without a community for it to serve? This philosophy is manifested in the approach of the California Healthy Nail Salon Collaborative, an organization Julia and Thu co-founded, with some help from WVE and the National Asian Pacific American Women’s Forum. The organization relies on the expertise of nail salon workers to inform and enhance the effectiveness of their advocacy. The work of their steering committee, which is made up of professional advocates, scientists and public health officials, is guided by the real needs of the community. In the organization’s research, they value equally the expertise of health and science professionals and the expertise of nail salon workers.

The California Healthy Nail Salon Collaborative, which I’ll now simply call the Collaborative, consists of forty organizational members from all over the U.S. The Collaborative gives power to the people by including nail salon workers and community members in their

work. The women at the Collaborative influence decision-making by advocating for policy that protects the health and safety of nail salon workers. They also educate the public about the issues nail salon workers face.

At the same time she was working for the Collaborative, Thu was also publishing troubling epidemiological research about nail salon workers.

In 2011, Thu and her team of researchers found evidence linking the profession of nail salon work with negative health effects. Establishing the connection between negative health impacts, their source, and a group of people is the aim of epidemiological research. Without it, it is difficult to pinpoint a cause-and-effect relationship between salon work and health effects.

Quach's research team reported that approximately one-third of surveyed nail salon workers said they began experiencing skin, eye and respiratory irritations, headaches, nausea, and/or trouble breathing after they entered the profession. The researchers found evidence of a connection between salon work and health as far back as 2008, reporting that "these health problems are likely to be work-related since participants reported that the symptoms began after they began working in the industry."

In that same study, the researchers found that 62 percent of surveyed nail salon workers experienced some type of health problem that the researchers said could potentially be connected to nail salon work. This is a substantial percentage of those studied. Of those workers, 42 percent reported chronic pain that began only after entering the career field.

As of 2011, only around ten percent of the 10,000 chemical ingredients used in personal care products, including nail salon products, have been evaluated for safety, so these reported

health effects are somewhat unsurprising. This lack of safety testing, compounded by the lack of oversight by the FDA have led to nail salon workers' daily exposure to numerous unevaluated chemicals.

Not knowing what's in so many nail salon products makes evaluating nail salon workers' exposure tricky. Alex told me, "We get asked a lot, 'What are the worst chemicals?' But especially with salon products, there's not a lot of disclosure. Sometimes, we can't even find out." Often the ingredients in nail salon products are not listed on the package. This is partially because of a FDA loophole that allows products deemed "For Professional Use Only," like some salon products, to be exempt from the regulations that require ingredients to be listed. And like fragrance, if you don't know what's in it, it's hard to understand how it will impact health.

So, what do we know? Surprisingly, despite a lack of disclosure, researchers have learned a fair amount about these products—more than enough to know that the presence of these ingredients needs to be acknowledged, and that they must be properly regulated.

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In the last decade, the "toxic trio" has gained national attention. Advocacy groups like WVE and the Collaborative have focused on the trio—toluene, formaldehyde, and dibutyl phthalate—because of the chemicals' particularly harmful health effects.

Toluene, a solvent found in nail polish and glue, has a long-time established dossier of toxicity across multiple occupations. It can enter our blood via our lungs and through our fingernails. Toluene is a neurotoxin and can cause kidney damage, liver damage, and birth defects. Repeated exposure to low to moderate levels of toluene can cause headaches, fatigue, confusion, and acting as though one is drunk.

Toluene is used in nail products because of performance and price. “Toluene is really cheap; certainly, it’s one of the reasons it gets used. It works and it’s cheap,” Alex explained to me, “But it’s just really bad for you—particularly if you’re a woman.” Toluene has been associated with miscarriages among exposed workers; one epidemiological study found a three-fold higher risk of experiencing miscarriage among workers who had been exposed to toluene. However, in 2014, the Office for Environmental Health Hazard Assessment de-listed toluene as a female reproductive toxin from Prop 65.

Prop 65, or more formally called “The Safe Drinking Water and Toxic Enforcement Act of 1986” requires the state of California to keep current lists of chemicals that are known carcinogens or developmental toxins. Prop 65 is intended to help keep Californians informed about what kind of chemicals are in their homes and environment. Though curated by California, the list is a helpful resource for everyone. Toluene remains on the Prop 65 list as a developmental toxin, as prenatal exposure of a fetus can result in developmental disabilities.

Formaldehyde, the second member of the trio, is used as preservative and nail hardener, and is a known carcinogen. Prop 65, the National Toxicology Program, the EPA, and the International Agency of Research on Cancer (IARC) recognize formaldehyde as a carcinogen or probable carcinogen. IARC lists formaldehyde as a group 1 carcinogen, a designation that represents the group’s highest level of scientific certainty. IARC has concluded that formaldehyde causes leukemia and cancer of the nasopharynx. The chemical can also cause dermatitis, which often takes form as an inflamed rash. Formaldehyde is irritating to the eyes, nose and throat. You’d be hard-pressed to find a toxicologist who wouldn’t say formaldehyde is toxic.

The third is dibutyl phthalate, DBP, a plasticizer and solvent, which is a reproductive toxin that causes birth defects, especially in boys. California's Prop 65 lists the chemical as a known developmental toxin, and reproductive toxin to both males and females. Because of the health effects associated with DBP, the European Union banned the chemical's use in cosmetics, and the United States banned the chemical's use in childcare articles.

Because of these particularly egregious health impacts, the toxic trio seemed like an easy target for advocates, but they still had to work for it. In 2006, Bryony, Charlotte, Stacy, Jane, and other activists organized a campaign pressuring OPI to take the toxic trio out of their polishes. The company had already reformulated its polishes without DBP for the European market and the women wanted similar products in the U.S. The women organized a letter-writing campaign, and printed ads in papers in the LA area where OPI is headquartered. The ads featured fake polishes playing on OPI's witty names: *Formaldehyde Formal*, *Bouquet of Carcinogens*, and *Tiara-ific Toluene*.

"It was *so* much fun," Bryony told me, laughing about creating the names over the crowd in busy Missoula bar. When I emailed Bryony for an interview, I offered two options: coffee or a glass of wine. She went for the wine. At the bar, we both ended up ordering cocktails anyway. Since founding WVE and the Campaign for Safe Cosmetics, Bryony has worked for numerous notable organizations, building quite the impressive CV along the way. Although the focus of her career has changed, and I could she tell she's told some of her stories a million times, when I asked, Bryony told them again anyway, and with a smile that seemed to hint at a bit of nostalgia.

"We really messed with the industry in a fun way." Bryony told me, her nostalgic smile shifting into a slight, almost mischievous, one, as she stirred her drink with two tiny straws, punching through the ice as she laughed.

Bryony said that part of the reason for the creative campaign was constrained resources: “These are very much David and Goliath fights. The resources we had compared to the industry the size of the cosmetics industry was laughable... We didn’t have any money to spare.” Action on a small budget required being strategic.

So a group of about twelve women headed down to Santa Monica, dressed as beauty queens with sashes that read “OPI Miss Treatment.” The women paraded through a popular pedestrian mall, catching the attention of news crews. It was kitschy, but the publicity stunt worked. In only three months of concentrated effort, OPI removed the toxic trio from their nail polishes.

Even with this success, OPI still hasn’t removed formaldehyde from all its products more than a decade later. Alex says that after the campaign, the company announced that its products were free of the toxic trio, but Alex went online one day and found that one of their nail hardeners still contained formaldehyde. She said apparently, some consumers complained, liking the one with formaldehyde better, and so the company wanted to continue to offer that product. She said, “So, they sort-of—half get it?”

In 2012, the California’s Department of Toxic Substances Control (DTSC) reported companies’ claims of nail products as free of one of more toxic trio chemicals were unsubstantiated. Ten out of twelve products that claimed to be toluene-free actually contained toluene. The worst offender was Sation 99 basecoat, which was made of seventeen percent toluene. Following closely behind was New York’s “Summer” nail polish, containing thirteen percent toluene.

The report also found that five out of seven products that claimed to be totally toxic trio-free contained at least one of the three. And in products claiming to be completely free of the

toxic trio, “DBP was found in greater concentrations than in products making no claim at all.” The worst offender was again Sation 99 basecoat, containing 82,000 parts per million of DBP.

Other phthalates besides DBP are frequently used in nail products (as well as fragrance). Information about the health effects of phthalates is somewhat controversial. On one hand, the FDA says that phthalates in cosmetics aren’t hazardous to health, but the agency decided this based only on the health of consumers, not on the health of nail salon workers.⁷ However, the CDC reports an association with phthalates in the blood in women of childbearing age, and “increase incidence of early onset of puberty and reproductive problems among children.” A number scientists’ research supports the CDC’s statement.

In the nail salon, workers are exposed to phthalates through inhalation. Because some phthalates readily off-gas, salon workers can be exposed to the group of chemicals through volatile salon products. Other phthalates can be absorbed through the skin. Salon workers work without gloves and often use their own fingernails as “tools” to correct polish mistakes, exposing them to phthalates dermally.

Chemical ingredients used in the artificial nail process have a particularly long, nasty track record. In 1974, methyl methacrylate (MMA), a chemical used in artificial nail glue, was banned at concentrations of 100 percent MMA because it was considered so harmful to human health. MMA is a reproductive toxin, can cause or exacerbate asthma, and can cause the loss of the sense of smell. Despite these health impacts, in 2002, the Cosmetic Ingredient Review, the safety board discussed in Chapter 1, determined that MMA is “safe as used when application is accompanied by directions to avoid skin contact.” This seems unlikely as artificial nails are

⁷ However, this determination from the FDA might be underrepresenting the risk of chronic exposure to low doses of phthalates. We don’t yet understand all of the impacts that this kind of exposure might have on consumers.

applied to your fingernail, which is, in my expert opinion, pretty close to your skin. We can presume that as a result of CIR's determination, the FDA currently has no restrictions on MMA.

About 30 smart states and state cosmetology boards have banned or restricted MMA's use. For one, California's Board of Barbering and Cosmetology "has concluded that liquid methyl methacrylate is a poisonous and deleterious substance that should not be used in fingernail preparations."⁸ We can only wish that all states would ban MMA in all forms.

It's great that so many states have responded by being on the side of the science, but it seems like there's still a lot of the chemical floating around in salon air. Despite MMA being banned in Utah, one study in Salt Lake City found the presence of MMA in over half the establishments the researchers tested. Thu and her team also found MMA at levels three times higher than what's recommended by the EPA. Finally, University of South Florida researcher Adam Marty found that even though nail salon workers were using products labeled "No MMA," there were detectable levels of the stuff in the air. So, what gives? Cosmetics companies might be using MMA anyway, even in states where it's banned. Alex told me that there are so many small companies and manufacturers involved in the production of nail salon products, that it's hard to keep tabs on what all of them are up to. Since MMA isn't banned in every state, companies could simply be using the same products nationwide and mislabeling them. Or worse yet, companies might not even know what's in them because the manufacturers that they contract with to make their products still use the chemical; the manufacturer could label the product as MMA-free, but never tell the company what's really inside. WVE found some anecdotal

⁸ Interestingly, similar chemicals are used in dental preparations. Alex says, "There is some crossover... in chemicals between nail salons and dental products. The same stuff they're making fake teeth out of, they're also making acrylic nails." Like nail salon workers, the majority of dental hygienists, the ones who are actually preparing the composite fillings, are females. But my mother, a former dental hygienist, tells me that now the fillings come pre-prepared from a factory. So now who makes those?

evidence that MMA is still used because it's so much cheaper than chemical alternatives. No wonder that infamous stench still hits when you walk in the salon.

To compound the problem with MMA, the ban of the chemical has led to the use of ethyl methacrylate, or EMA. This chemical might not be much of an improvement over MMA. EMA is a sensitizer and can contribute to the development of asthma. This is called a regrettable substitution—when prohibiting or restricting a chemical brings into use another chemical, which might actually be worse than the one it replaced. It's a constant dilemma faced by toxicologists and advocates in this field.

After the Campaign for Safe Cosmetics and other collaborating partners' modest success in pressuring companies to remove the toxic trio, some companies turned to triphenyl phosphate, TPHP, a plasticizer, as a replacement for DBP. In the DTSC report, the researchers also found the presence of TPHP in nail products. Orly and Essie, two popular nail polish brands, both contained TPHP. Not only is TPHP used as a plasticizer, but it's also a flame retardant chemical commonly added to polyurethane foam used in mattresses and furniture.

Orly and Essie weren't the only ones. In report by Emma Mendelsohn, a researcher at Duke, she and her team found TPHP in ten nail polishes. The researchers did not reveal which brand names contained TPHP (as is typical in scientific studies using real brands), but almost 400 nail products list the chemical or are known to contain it. The number could be much higher. The study's sample size is indeed small and the researchers weren't sure if absorbing nail polish through the cuticle or nail bed is a route of significant exposure, but since women paint their nails (at home or in the salon) once a week on average, it is a possibility worth a follow-up. Especially given the lack of information on TPHP's human health impacts. We do know that TPHP, a component of the common flame retardant Firemaster 550, is a suspected human

endocrine disruptor. The chemical alters cells that produce testosterone and luteinizing hormone, important human hormones. Yet another regrettable substitution⁹.

...

I have never been a fan of the long, acrylic nail look. Shout out to Adele for being able to pull it off, but I worry about basic things like opening cabinets, holding a pencil, scratching my face. I think learning how to navigate these kinds of nails would be a steep learning curve, especially in a service industry job. Instead, I've leaned towards more natural looking nails. Gels, while unnatural were much more manageable, and looked quite a bit closer to natural nails than acrylics do.

Other women (and men; the incidence of men visiting salons is steadily rising) seem to mirror my preferences. The use of acrylic nails is trending downward while the use of gel nails is trending upward. Other people also seem to appreciate that if you jam your nail right into the counter after a manicure, you won't screw up your gel manicure.

When gels first hit salons, they were touted as safer than acrylics. When I asked Alex about it, I was secretly hoping she would tell me that indeed they were safer. Instead, she said that many gel manufacturers use chemicals similar to the acrylic nail process. *Damn.* Thu agrees with Alex. While manufacturers like to call some gels "polish," they're usually just another kind of artificial nails. And just like acrylics, they use acrylates. Along with acrylates, Alex told me that "There are definitely some different chemicals in there that we don't totally understand. There doesn't seem to be a huge health advantage." *Double damn.*

⁹ There are a number of other chemicals of concern in nail salon products: ethyl cyanoacrylate, used in artificial nail glue; acetone, used in nail polish remover; acetonitrile, used in nail glue remover, and; methylene chloride and benzoyl peroxide, both used in the artificial nail process. Ew.

Often, our fingernails become addicted to gels—mine included. Gels weaken the nail underneath so when they are removed, the nail can be softer and more flexible. The solution? Another set of gels, of course. Or nail hardeners, which often contain formaldehyde. Because, for some reason, formaldehyde is really good at strengthening (or mummifying, for that matter) your nails.

These artificial nails, gels included, can send us into a negative feedback loop: great manicure, removing said manicure, noticing our crappy nails underneath, needing another manicure. Repeat the cycle. I did.

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It's unfortunate that gels destroy my nails, that I breathe in some acrylates in the process of getting them, and that I might be absorbing some toxic chemicals through my nails, but what about the women doing these manicures every single day? There are thousands of women doing gels—on top of acrylics, airbrushing, mani-pedis, Shellac and more. What we as consumers face is ugly, but what nail salon workers face is even worse.

Not only do nail salon workers face hazardous chemicals every day, but they frequently do so without proper safety protections. Most nail salon workers either do not use gloves or don't use the right ones; they need nitrile gloves, not latex or vinyl, to protect themselves from the chemicals. Most salons don't have proper ventilation—either in the form of local exhaust ventilation systems (which look like giant vacuums that hover above a nail station and suck up fumes) or general ventilation systems (installed in the salon as a whole). And without these systems, which are largely unregulated across the country, nail salon workers can be exposed to chemical levels above those that are permissible by regulatory agencies (if they've set permissible limits at all).

Since most nail salons don't have exhaust systems, nail salon workers really should be using respirators, like the ones people use in the asbestos removal industry or in Ghostbusters, but if you walked into a nail salon and saw a nail technician using a hazmat-style respirator, would you stay? Probably not. A little voice in the back of your head might ask, "Hey, what's in these products that these women need to use respirators?" My guess is that wouldn't be so good for business. Nobody wants to feel like they're walking into a nuclear dead zone – just to get a manicure.

Because of all of this chemical exposure, nail salon workers face a surprising number of negative health effects. The most common health effects are respiratory issues like nose, throat or lung irritation, and skin conditions, like dermatitis, irritations, rashes, and burning.

Nail salon workers have an increased chance of developing asthma, which is exacerbated by doing artificial nails. Research by Cora Roelofs from the University of Massachusetts, Lowell's Department of Work Environment suggests a connection between salon work and respiratory issues.

Cora and her team, which included collaborators from the Vietnamese-American Initiative for Development and advocacy group New Ecology, also reported that of 71 surveyed nail techs with skin conditions, one-third self-reported that their symptoms improved when they were away from the salon. The study found that lifestyle factors (like smoking) did not play a role in seventy-one technicians' health symptoms. Though Cora's research was collected from a small sample, when taken in combination with Thu's research, the women's results suggest that working in a nail salon could be the sole source of some nail salon workers' health effects. Of course, more research is always needed in the science world, especially to substantiate this kind

of association. Because, indeed, this kind of association is a big deal; it helps researchers get closer to the source of a group's health effects.

Nail salon workers can face skin conditions early on in their nail salon careers, which can persist until they retire. However, often many nail salon workers just think of their issues as “part of the job” and these conditions are “suffered silently.”

Besides these common health issues, nail salon workers also suffer from “invisible” conditions. They face ergonomic issues from improper tools and bad furniture. They continually schlump over to get those polka dot nails just right. They struggle with those of us who thrash around during pedicures because we're ticklish. It's uncomfortable, awkward, and causes injury. More seriously, they also face reproductive complications, mental health impacts like depression, immune disorders, and more. To compound this issue, many of these conditions are stigmatized by our society.

These health effects are complicated by access to healthcare. Because many nail salon workers are “booth renters” or contractors, rather than regular employees, they are not offered the same healthcare benefits. While some of these individuals may be able to choose Affordable Care Act plans, others prefer employers' insurance plans, as the spectrum of benefits can be larger. However, these plans are not often available to nail techs. At Johns Hopkins University in 2012, Lori Edwards also found that 37 percent of nail salon workers surveyed did not have health insurance.¹⁰ This is a considerable number of nail technicians working without healthcare.

Immigration status can also impede access to healthcare, as most undocumented immigrants are not eligible for Obamacare, except for special cases. Some states, like California, offer insurance enrollment options for some undocumented immigrants, but not the entire group.

¹⁰ This number might have decreased, thanks to President Obama's Affordable Care Act, but I was not able to locate any more recent numbers.

A lack of access to healthcare can result in chronic illness or injury that might put a nail tech out of work for extended periods of time, and restrict access to preventative care, which can lead to overuse of the ER for routine care.

This is problematic for nail salon workers, and also for their children. Donna Heron of the EPA reports that, “it is not uncommon to find children playing in the work area or in the back room of some salons.” The children of nail salon workers are exposed to the same chemicals as their mothers. Scary—especially since because children’s bodies are still developing, they are often more sensitive to chemical exposure.

The problems that result from going without healthcare are exacerbated by a lack of a living wage. In many parts of the country, nail salon workers make less than a living wage. Lori Edwards found that “a significant portion [of 176 nail salon workers surveyed] rated their financial status as ‘getting by’ or ‘having few resources.’” Though this is quite vague, this gives us some insight into what is presumably happening in nail salons worker populations around the country.

A lack of living wage can create debt, unpaid medical bills, going without needed healthcare, fewer educational opportunities for children, cycles of poverty, unsafe or unhealthy housing situations, and more. As a group experiencing demonstrable health effects, often without access to healthcare, a living wage is ever more critical.

When I spoke with Thu, she emphasized the importance of this issue. As we move into a presidential administration hostile to immigrants, it is unlikely we will see improvements in health care access for immigrants. Her organization, Asian Health Services, is currently brainstorming ways in which they can address this challenge in the Oakland area as we face political turbulence from President Trump’s anti-immigrant policies. In uncertain times for the

community, Thu is optimistic. She told me, “I am hoping that the one good thing that can come out of this [political] climate that we’re entering is that people really connect to work together to leverage our causes’ strengths.”

What it comes down to is that this is about so much more than gel manicures. By working every single day to make us our most beautiful selves, nail salon workers, the people behind those manicures, are exposed to harmful chemicals and experience far-reaching health effects. This is compounded by other injustices—access to health care, and fair living wages. This context demands that our solutions for this problem must extend beyond the salon.

...

Until we can deal with the underlying injustices impacting the health of nail salon workers, we can start with safer salon environments. The California Healthy Nail Salon Collaborative is making strides in that direction. In 2009, the Collaborative started the Healthy Nail Salon Recognition Program in California. The voluntary program “rewards salons that prioritize the health of its workers and consumers.”

Safe salons are required to institute nine guidelines to be considered a “Healthy Nail Salon.” The requirements include using nail polish without the toxic trio, remover without ethyl acetate or butyl acetate, nitrile gloves and proper ventilation, as well as avoiding polish thinners, training all staff, and committing to use safer products in general. The guidelines also bar allowing customers to bring in their own products if they are unsafe. The Collaborative provides free training to salons that are interested in participating, and has begun reaching out to salons outside the state of California, offering advice for establishing similar programs.

This program, started in San Francisco, spread across California, and by 2015 was in five cities and counties with over 100 salons certified. The growing success and interest led the

Collaborative to seek a statewide program, and in mid-October of 2016, California passed the Healthy Nail Salon Bill.

The bill was result of Asian Health Services and the Collaborative's efforts. Like the Healthy Nail Salon Program, the bill gives recognition to salons using safer products. The "Healthy Nail Salons," as they will be called, are required to institute a number of actions to protect the health of nail salon workers. The voluntary program will work with California's Department of Toxic Substances Control to create guidelines for the Healthy Nail Salons. Although the organizations have not yet published the guidelines, they will likely be similar to those of the Healthy Nail Salon Program.

If the guidelines are equal to those of the Healthy Nail Salon Program, the Incentive Program will be a great first step for many California salons. Using products without the toxic trio and other listed chemicals is definitely moving in the right direction, but there are numerous chemicals of concern in nail products. For example, the guidelines for the previous program do not include requirements to prevent the use of prevalent toxic chemicals like TPHP and phthalates.

While there are very few options for safer nail salon products in the current marketplace, WVE hopes that the bill, with the growing demand for safer products, will drive industry innovation. There are currently a number of "three-free" nail polishes without the toxic trio, but as stated before, many of them might still contain one of the three chemicals, they are often not long-lasting, and come in a limited number of colors. I've often wondered how hard it is to make safe nail polish. It seems industry just needs a kick in the pants to push polishes in that direction. There are even fewer safe options for long-lasting nails like gels. And because of regrettable

substitutions, the ever-changing use of chemicals in products, and a lack of scientific testing, this program is imperfect. But still, it's something.

...

When I asked Bryony if she still gets manicures, she said yes—just without the nail polish. She goes for the foot rub and the exfoliation, but the nail polish is a little too suspect for her. I don't think Alex gets manicures, but she tells me that it's still important that we find chemical alternatives to swap-in for harmful ones. Julia, though, really advocated for getting manicures and pedicures. It is, after all, an industry that a large number of workers rely on across the country. She lives in California and has access to Healthy Salons, but if she can't find one, she uses manicures as an opportunity to chat with nail techs about salon chemicals.

My attachment to nail polish is stronger than I'd like to admit. One month ago, a close friend from college got married back in Minneapolis. I flew in for a long weekend, grateful to connect with old friends. Emily, my best friend from college, wanted to get her nails done for the event. I was conflicted.

I am still trying to find the right balance between protecting my health, the health of nail salon workers, and supporting an industry dominated by strong women. I continue to hold out for a safe gel. Until then, I'll save the manicures for special occasions, and I'll bring my own polishes.

Armed with all of this knowledge, I finally agreed to go with Emily. I took her to that same Uptown, Minneapolis salon, from my service industry life past—the one on Hennepin Avenue.

Conclusion to the *Poison in Pink*

In its final form, I intend this manuscript to exist in four parts. The first section will start in the home, unpacking the products that most consumers would find in their vanities or bathroom cabinets. This chapter is intended to get readers invested in the topic on a personal level before zooming out to larger impacts. Chapter 1 of this thesis manuscript, “A Few Drops of No. 5” will be part of this section.

This section will also discuss other common personal care products. I hope to research and discuss: hair products like shampoo, conditioner, and hair dye; makeup like lipstick, blush and foundation; and sunscreen and bug repellent.

The second section will zoom out slightly to discuss different communities that are disproportionately impacted by chemicals in personal care products. The second chapter of this thesis manuscript, “Polished,” will be part of this section. In this section, I will also include information on hairstylists, massage therapists, and products that are marketed specifically to communities of color, like hair relaxers and skin lighteners.

The third section will zoom out even farther to explore the environmental impacts of personal care products. In this section, I will present the lifecycle of common personal care products—from manufacture to disposal. I will also uncover the personal care product and fragrance industries’ intimate relationship with the oil industry, as well as their relationship to other large chemical industries. In this section, I will make connections to global climate change and human dependence on fossil fuels.

Finally, the book will conclude with a section aimed at consumers, motivating them to affect change. This section will be split up into two subsections. The first will offer information about making changes using the power of the consumer. For example, I will discuss key

ingredients to avoid, how to read labels, which companies disclose fragrance ingredients, which companies make safer products, and offer resources for being a smart consumer. The second subsection goes beyond buying power and offers readers strategies to affect systemic change. Though I am unsure how this section will manifest in terms of content, I hope that my research process will help me gain knowledge of effective strategies, which I will share in this subsection.

The manuscript will continue to combine evidenced-based research, interviews, nonfiction narrative, and science communication. I will conduct multiple interviews for each chapter, presenting the stories of everyday consumers, industry representatives, advocates, toxicologists, and epidemiologists. I anticipate that this project will be completed by the end of 2018.

Source Notes

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Chapter 2: Polished

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The Los Angeles-Long Beach-Glendale Metropolitan Division of California is an area employing the second highest number of salon workers in the United States. The average income for nail salon workers in this area is \$21,000 and the average hourly wage is \$10.10. But in a similar metropolitan area, Los-Angeles-Long Beach-Anaheim, the living wage for two parents with one child is \$14.99 and for two parents with two children, the living wage is \$17.10. So

what we have is a \$5 to \$7 discrepancy; for a salon tech working 40 hours a week, that's about \$200 to \$300 each week that nail salon workers are short in making a living wage. That's a lot of money. These two areas do not directly map on to one another, but presumably, comparing these two exact areas would not account for the large discrepancy since Anaheim and Glendale have similar median household incomes and similar poverty rates.

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